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Expanding VPIC Portability to Large Scale GPU Systems[1] NIGEL TAN, MICHELA TAUFER, University of Tennessee, Knoxville, SCOTT LUEDTKE, ROBERT BIRD, BRIAN ALBRIGHT, Los Alamos National Laboratory — Vector Particle-In-Cell (VPIC) is a state of the art plasma physics simulation code with a history of large scale simulations, with recent simulations reaching 10 trillion particles over 2 million processes. The key to VPIC performance is its platform specific optimizations. The growing diversity in heterogeneous platforms makes continuously re-writing legacy codes, including VPIC, infeasible for the community due to portability issues. These issues can be addressed by frameworks such as Kokkos that enable developers to write codes once and compile them for different platforms. In so doing, scientists can focus on scientific models and discovery, while delegating hardware specific tuning to the Kokkos runtime. Our work is part of a broader effort to modernize VPIC portability across heterogeneous platforms, while reaching new milestones in particle scale and simulation performance. Here we present a high performance, portable variant of VPIC with platform agnostic algorithm optimizations using Kokkos and the lessons learned from running our variant on the GPU-accelerated Power9 system, Summit. Our results show near linear weak scaling on over 12,000 Summit GPUs.

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